CUMULATIVE RISK ASSESSMENT OF LEAD, CHROMIUM AND ZINC IN GROUNDWATER AND DRINKING WATER: A CASE STUDY FROM PORT-AU-PRINCE, HAITI

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Drinking water can be considered as a complex mixture that consists of tens, hundreds or thousands of chemicals of which the composition is qualitatively and quantitatively not fully known. In Port-au-Prince, groundwater pollution by contaminants from waste deposal sites and industrial wastewater is a well-known environment issue and poses a substantial risk to local resource users. The presence of heavy metals (chrome, nickel and lead) has been identified in water from this environmental media. Concentrations of lead [40 µg/L], Nickel [250 µg/L] and Chromium [470 µg/L] greater than the respective threshold value of these metals in drinking water, were measured in groundwater. Studies on human exposures to chemicals and associated health effects in drinking water allow to major chemical risks, particularly for children, relating to Pb(II), Cr(III), Cr(VI) and Ni(II) contained in the groundwater. However, this research has been only conducted on single chemicals. The aims of this study were (i) to carry out a brief review of to health impact from exposure to chemical mixtures in order (ii) to evaluate the cumulative risk assessment of heavy metals for human health in drinking water. Hazard index evaluation method (HI) has been used to assess the health mixture effects of the selected heavy metals on hepatic, renal organs on the groundwater consumers. A more-than-additive joint toxic action (HI >1) has been obtained for the hazard index (HI) calculation of the 3 metals on both target organs. These results require monitoring in order to understand and manage the cumulative human health risk by heavy metals in Port-au-Prince's drinking water.

Keywords: heavy metals, drinking water, cumulative risk assessment